

TABLE 10.2 Physical properties of alcohols

COMPOUND	NAME	mp (°C)	bp (°C) (1 atm)	DENSITY d_4^{20} (g mL ⁻¹)	WATER SOLUBILITY (g 100 mL ⁻¹ H ₂ O)
Monohydroxy Alcohols					
CH ₃ OH	Methanol	- 97	64.7	0.792	∞
CH ₃ CH ₂ OH	Ethanol	- 117	78.3	0.789	∞
CH ₃ CH ₂ CH ₂ OH	Propyl alcohol	- 126	97.2	0.804	∞
CH ₃ CH(OH)CH ₃	Isopropyl alcohol	- 88	82.3	0.786	∞
CH ₃ CH ₂ CH ₂ CH ₂ OH	Butyl alcohol	- 90	117.7	0.810	8.3
CH ₃ CH(CH ₃)CH ₂ OH	Isobutyl alcohol	- 108	108.0	0.802	10.0
CH ₃ CH ₂ CH(OH)CH ₃	<i>sec</i> -Butyl alcohol	- 114	99.5	0.808	26.0
(CH ₃) ₃ COH	<i>tert</i> -Butyl alcohol	25	82.5	0.789	∞
CH ₃ (CH ₂) ₃ CH ₂ OH	Pentyl alcohol	- 78.5	138.0	0.817	2.4
CH ₃ (CH ₂) ₄ CH ₂ OH	Hexyl alcohol	- 52	156.5	0.819	0.6
CH ₃ (CH ₂) ₅ CH ₂ OH	Heptyl alcohol	- 34	176	0.822	0.2
CH ₃ (CH ₂) ₆ CH ₂ OH	Octyl alcohol	- 15	195	0.825	0.05
CH ₃ (CH ₂) ₇ CH ₂ OH	Nonyl alcohol	- 5.5	212	0.827	
CH ₃ (CH ₂) ₈ CH ₂ OH	Decyl alcohol	6	228	0.829	
CH ₂ =CHCH ₂ OH	Allyl alcohol	- 129	97	0.855	∞
(CH ₂) ₄ CHOH	Cyclopentanol	- 19	140	0.949	
(CH ₂) ₅ CHOH	Cyclohexanol	24	161.5	0.962	3.6
C ₆ H ₅ CH ₂ OH	Benzyl alcohol	- 15	205	1.046	4
Diols and Triols					
CH ₂ OHCH ₂ OH	Ethylene glycol	- 12.6	197	1.113	∞
CH ₃ CHOHCH ₂ OH	Propylene glycol	- 59	187	1.040	∞
CH ₂ OHCH ₂ CH ₂ OH	Trimethylene glycol	- 30	215	1.060	∞
CH ₂ OHCHOHCH ₂ OH	Glycerol	18	290	1.261	∞

Ethers, however, are able to form hydrogen bonds with compounds such as water. Ethers, therefore, have solubilities in water that are similar to those of alcohols of the same molecular weight and that are very different from those of hydrocarbons.

Diethyl ether and 1-butanol, for example, have the same solubility in water, approximately 8 g per 100 mL at room temperature. Pentane, by contrast, is virtually insoluble in water.

Methanol, ethanol, both propyl alcohols, and *tert*-butyl alcohol are completely miscible with water (Table 10.2). The remaining butyl alcohols have solubilities in water between 8.3 and 26.0 g per 100 mL. The solubility of alcohols in water gradu-